Annual Review 1981

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U.S. ZINC and CADMIUM INDUSTRIES

Including Statements from Other Countries

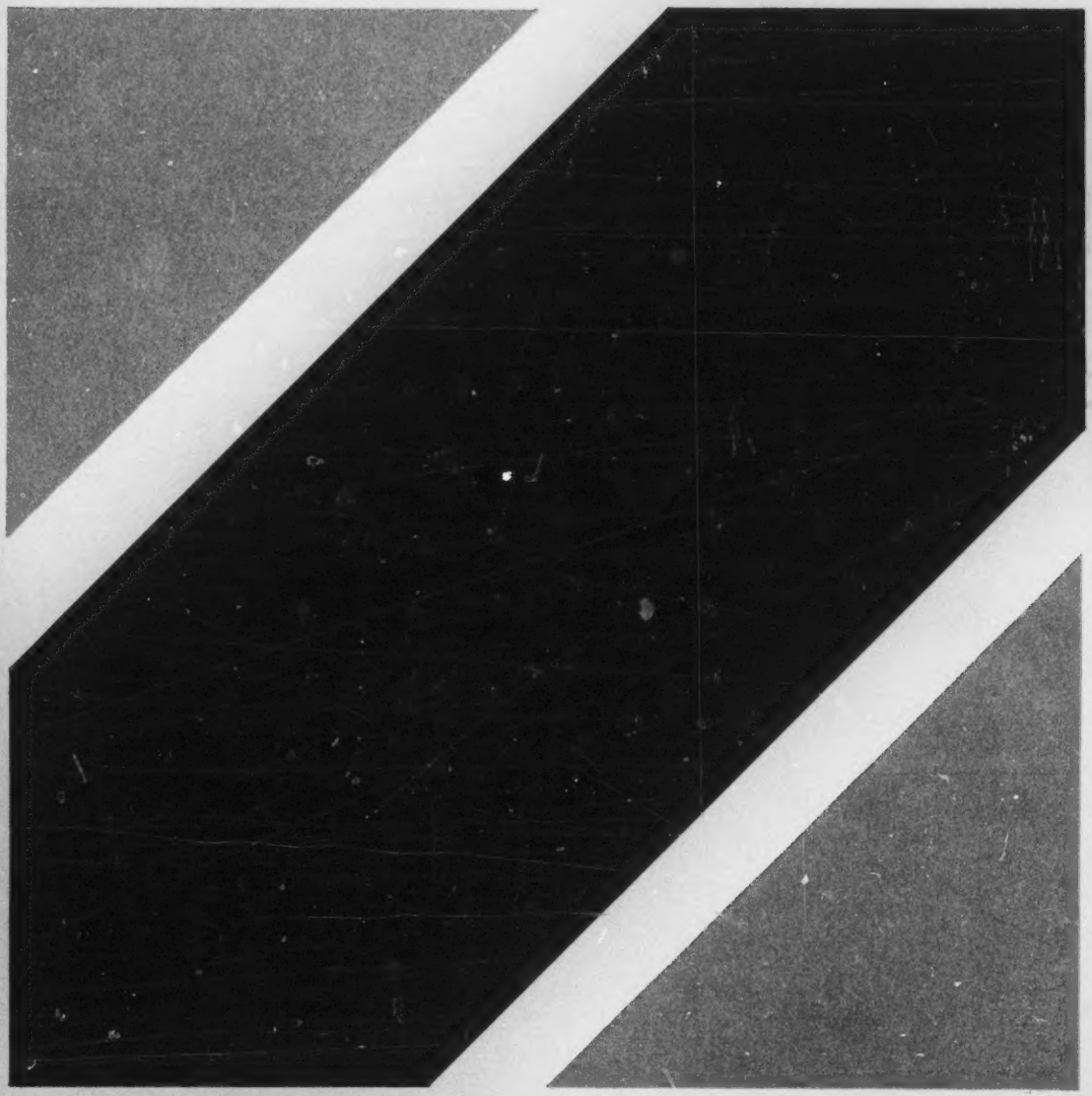


TABLE I. TOTAL SLAB ZINC SMELTER OUTPUT REPORT (ALL GRADES) Tons of 2,000 lbs.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	PRODUCERS STOCK AT BEGIN.		GSA METAL		TOT.	SHIPMENTS-INCLUDE GSA (Countries)				PRODUCERS STOCK AT END			
	Smelters	Elsewhere	Smelter Production Incl. GSA Metal	Purchased for direct Shipment	Available (1+3+4)	Domestic	Export+ OECD	Drawback Other	Total 6+7+8	Smelters 5 - 9	Elsewhere	Daily Avg. Prod.	GSA Metal Included in Col. (3)
1970	78,313	12,146	961,153	—	1,039,466	891,511	—	20,630	912,141	127,325	28,905		
1971	127,325	28,905	840,178	—	967,503	906,377	—	10,537	916,914	50,589	15,433		
1972	50,589	15,433	765,415	34,672	850,676	814,609	—	4,292	818,901	31,775	131,185		81,467
1973	31,775	13,185	687,861	54,917	774,553	726,531	1,130	17,599	745,260	29,293	4,287		11,907
1974	29,293	4,287	590,181	76,262	695,736	643,900	1,378	7,561	652,839	42,897	2,691		44,636
1975	42,897	2,691	445,916	443	489,256	421,747	—	60	421,807	67,449	22,040		3,688
1976	67,449	22,040	535,953	—	603,402	514,595	—	—	514,595	88,807	28,277		97
1977	88,807	28,277	434,054	—	522,861	457,074	—	—	457,074	65,787	51,956		—
1978	65,787	51,956	444,790		510,577	472,207			472,207	38,370	22,631		
1979	38,370	22,631	537,427	—	575,797	514,254	—	—	514,254	61,543	17,909	—	
1980	61,543	17,909	358,609	—	420,152	399,588	—	—	399,588	20,564	9,420	—	—
1981													—
Jan.	20,564	9,420	33,445	—	54,009	35,612	—	—	35,612	18,397	8,678	1,079	—
Feb.	18,397	8,678	31,457	—	49,854	31,086	—	—	31,086	18,768	7,290	1,123	—
Mar.	18,768	7,290	34,450	—	53,218	32,280	—	—	32,280	20,938	4,311	1,111	—
Apr.	20,938	4,311	34,051	—	54,989	37,364	—	—	37,364	17,625	4,943	1,135	—
May	17,625	4,943	32,218	—	49,843	32,634	—	—	32,634	17,209	3,843	1,039	—
June	17,209	3,843	30,828	—	48,037	30,179	—	—	30,179	17,858	5,365	1,028	—
July	17,858	5,365	33,018	—	50,876	30,012	—	—	30,012	20,864	5,525	1,065	—
Aug.	20,864	5,525	33,534	—	54,398	31,518	—	—	31,518	22,880	6,218	1,082	—
Sept.	22,880	6,218	29,424	—	52,304	30,786	—	—	30,786	21,518	4,109	981	—
Oct.	21,518	4,109	29,778	—	51,296	24,268	—	—	24,268	27,028	4,738	961	—
Nov.	27,028	4,738	29,276	—	56,304	21,444	—	—	21,444	34,860	2,762	976	—
Dec.	34,860	2,762	25,301	—	60,161	22,032	—	—	22,032	38,129	2,145	816	
Year			376,780			359,215			359,215				
Monthly Average			31,398			29,935			29,935				

Source: American Bureau of Metal Statistics

Review of Zinc in the United States in 1981

ZINC MARKETS IN 1981

In 1981 the economic slow-down of 1980 deepened into a recession with a disastrous year for the automotive and housing industries and decreased industrial output in many sectors of the economy. The year ended with a high unemployment rate of 8.9%. Good news came, however, with the annual inflation rate of 8.9%, the lowest since 1977.

Zinc consumption showed an increase of 3% over 1980, certainly a respectable showing in a year when its two largest end-use industries—autos and construction—did so poorly. The U.S. Bureau of Mines estimates that the U.S. consumed 920,719 tons of slab zinc in 1981, 25,506 tons over the 1980 figure of 894,133 tons (Table 3). The galvanizing, brass and bronze market segments showed the strongest recovery from market losses in 1980.

. Total galvanizing increased 7% over 1980 (Table 4), consuming 446,642 tons in 1981 as opposed to 418,024 tons in 1980. U.S. steel shipments, although hit hard by increased imports (19% of the total 1981 market) and reduced demand for auto sheet, were up 3.8% in 1981, a modest recovery from the 18% decline in shipments experienced in 1980. Continuously galvanized sheet and strip showed the strongest upsurge of 14% in 1981. Galvanized sheet markets have expanded in a wide range of products for use in automotive bodies, appliances, housing and commercial construction. Automobile manufacturers continue to use more galvanized sheet as well as Zincrometal® for increased corrosion resistance and vehicle durability. However, with auto shipments at their lowest level since 1961, the full impact of this upward trend has not yet been

TABLE 2. PRODUCER AND CONSUMER ZINC STOCKS
(Tons of 2,000 lbs.)

	End 1980	End 1981
Producer Stock at Smelters	20,564	38,129*
Producer Stock elsewhere	9,420	2,145*
Consumer Stock	64,216	76,705†

Source: †U.S. Bureau of Mines
*American Bureau of Metal Statistics

TABLE 3. U.S. SLAB ZINC CONSUMPTION BY MARKETS
(Tons of 2,000 lbs.)

	1977	1978	1979	1980	1981
Galvanizing	436,998	500,464	499,130	418,024	446,642
Brass & Bronze	141,438	155,964	155,871	108,937	124,167
Zinc Base Alloy	404,691	390,365	346,187	280,237	276,386
Rolled Zinc	30,210	27,413	24,299	23,259	25,507
Zinc Oxide	42,454	41,008	39,146	29,814	17,730
Other	45,974	42,856	38,345	33,862	30,287
Total	1,101,765	1,158,070	1,102,978	894,133	920,719

*Estimated undistributed allocated to end-use categories by American Bureau of Metal Statistics using 1981 final annual totals.

TABLE 4. CONSUMPTION OF SLAB ZINC FOR GALVANIZING

	1980	1981*
Sheet & Strip	243,328	277,040
Wire & Wire Rope	25,075	25,942
Tube & Pipe	40,868	40,682
Fittings (for Tube & Pipe)	8,150	6,445
Tanks & Containers	3,643	3,833
Structural Shapes	36,971	37,848
Fasteners	3,515	4,050
Pole-line Hardware	4,495	4,066
Fencing, Wire-Cloth and Netting	17,661	17,645
Other	34,507	29,091
Total	418,213	446,642

Source: U.S. Bureau of Mines

*Estimated undistributed allocated to end-use categories by American Bureau of Metal Statistics using 1981 final annual totals.

felt in the zinc market. The rest of the market for tube, pipe, wire, structural shapes, fencing, etc., remained relatively stable.

Consumption of slab zinc in hot dip galvanizing after fabrication increased in 1981 according to industry statistics gathered by the American Bureau of Metal Statistics. U.S. shipments of slab zinc to hot dip after fabrication galvanizing operations (excluding steel company operations, tube, pipe, wire and fencing) rose 7.5% from 111,159 tons in 1980 to 120,181 tons in 1981. With the inclusion of these other categories U.S. shipments rose 11% from 217,813 tons in 1980 to 241,371 tons in 1981. Major uses for hot dip galvanizing after fabrication are electric utilities, construction, agricultural and transportation equipment.

Zinc alloys consumed in die castings remained steady in 1981, decreasing about 1%, from 280,237 tons in 1980 to 276,167 tons in 1981. A third of the die casting market is consumed by the auto industry which had a disastrous year in 1980 with the lowest auto production since 1961. Total auto output of 6.2 million cars was 1.8% below 1980 output and nearly 33% off the 1978 production of 9.2 million cars. The stability of the zinc die casting market in a poor automotive year indicates that substitutions and the effect of downsizing for fuel economy have bottomed out. Some auto manufacturers are also returning to metal parts for better durability and appearance following customer complaints on plastics parts, and as a result of ZI's promotion of ThinWall technology.

The Eighth Annual Zinc Institute Survey of 427 zinc die casters reported 304,242 tons (Table 5) of zinc die castings shipped in 1980 as compared to 267,167 tons reported by the U.S. Bureau of Mines. The additional 37,075 tons reported in the Zinc Institute Survey are ascribed to zinc alloyers not reporting to the Bureau of Mines. The automotive market

TABLE 5. U.S. ZINC DIE CASTING TONNAGE

1981	304,242
1980	313,807
1979	382,655
1978	416,382
1977	418,319

Source: Zinc Institute Annual Survey

remained the largest zinc die casting market at 98,772 tons. In both 1980 and '81 automotive parts accounted for 33% of the marketplace (Table 6). The weight of zinc in the average car showed a moderate decline from 24.24 lbs. in 1980 to 22.69 in 1981 (Table 7). Builders hardware comprised the next largest market at 79,765 tons or 26%, followed by electric components at 38,372 tons or 13%. Other markets were domestic appliances at 26,892 tons or 9%; industrial, agricultural and commercial machinery at 25,122 tons or 8%; sporting goods and toys at 8,663 tons or 3%; scientific and professional equipment at 7,556 tons or 3%; sound and television equipment at 3,635 tons or 1%; and miscellaneous at 15,465 or 5%.

TABLE 6. ZINC DIE CASTINGS USED IN AUTOMOTIVE COMPONENTS*

1981	98,772
1980	103,593
1979	165,761
1978	192,492
1977	205,801

*These figures represent zinc die casting tonnage shipped January to January including the automotive after-market as well as buses and trucks.

Source: Zinc Institute Annual Survey.

TABLE 7. WEIGHT OF ZINC IN THE AVERAGE CAR

	lbs. per car
1981	22.69
1980	24.24
1979	27.98
1978	30.02
1977	39.53
1976	44.84

Source: Zinc Institute Annual Survey

The consumption of zinc in brass and bronze increased 14% to 124,167 tons in 1981 from 108,937 in 1980. Brass and bronze markets recovered somewhat from the 30% market decline suffered in 1980. Imports of copper and brass mill products increased dramatically in 1981; if this trend continues the brass market could be adversely affected.

Good news came for zinc in 1981 when the U.S. Mint announced its decision to make one cent pieces from a zinc alloy barrel-plated with copper. The phased in production of the zinc penny during 1982 will boost consumption of rolled zinc by about 20,000 tons the first year. The U.S. Mint projects using 50,000 tons in 1983, when the phase in to the zinc alloy penny will be complete. In 1981, rolled zinc consumption gained 10%, going from 23,259 tons in 1980 to 25,607 tons in 1981. Primary markets for rolled zinc have been battery cans for dry cell batteries and architectural applications, primarily roofing.

Zinc oxide, 50% of which is consumed in the manufacture of rubber tires and goods, felt continued losses due to low auto production and downsizing of autos and tires. Consumption of high purity French Process

zinc oxide (produced from slab zinc) fell 41% in 1981 to 17,730 from the 1980 figure of 29,814. Production of American Process lead free zinc oxide (produced from ore) remained steady in 1981 as compared to 1980 (Table 8). Shipments rose, however, from 147,198 tons in 1980 to 154,648 tons in 1981.

Other uses, which include light metal alloys, zinc dust, desilverizing lead, zinc chemicals and miscellaneous uses, declined by 10% from 33,862 tons in 1980 to 30,287 tons in 1981. Zinc dust, like zinc oxide, is produced from scrap and residues as well as from slab and its use is larger than the slab consumption figures might indicate. U.S. Bureau of Mines estimates that 43,000 tons of zinc dust were produced in the U.S. in 1981 for use in corrosion resistant coatings (Zincrometal), the manufacture of

TABLE 8. PRODUCTION AND SHIPMENTS OF LEAD FREE ZINC OXIDE
(Tons of 2,000 lbs.)

	Production	Shipments
1981		
American	70,616	75,904
French	60,921	60,426
Other	18,641	18,318
	150,178	154,648
1980		
American	85,073	82,633
French	50,446	51,310
Other	14,565	13,255
	150,104	147,198
1979		
American	170,519	108,896
French	64,095	67,248
Other	13,359	13,358
	247,973	189,502
1978		
American	115,956	114,651
French	70,021	67,642
Other	12,572	13,146
	198,549	195,439
1977		
American	116,835	118,050
French	67,445	67,863
Other	16,429	16,297
	200,709	202,210

Source: U.S. Bureau of Mines
1. From ores and ore scrap residues
2. From slab zinc, remelt and scrap.
3. From residues and scrap.

TABLE 9. PRODUCTION OF ZINC DUST IN THE U.S.

	p.
1981	43,000
1980	47,003
1979	39,888
1978	42,425
1977	47,594
1976	46,358

Source: U.S. Bureau of Mines

p: Preliminary

TABLE 10. SALIENT STATISTICS SLAB ZINC — UNITED STATES (Tons of 2,000 lbs.)

	1980	1981
U.S. Mine Production	369,122	336,504†
U.S. Slab Production	358,609	376,780*
Shipments from Smelters:		
Domestic	399,588	359,215*
Export	—	—
Total	399,588	359,215*
U.S. Government Stockpile Sales	—	—
Consumption	894,133	920,719*
Producer's Year End Stocks:		
Smelters	20,564	38,129*
Elsewhere	9,420	2,145*
Consumer's Stocks	64,216	76,705†
Imports for Consumption:		
Zinc Content of concentrate	201,028	270,847†
Slab	452,127	674,621†
General Imports:		
Zinc Content of concentrate	143,214	129,782†
Slab	452,652	664,356†
Average Price		
U.S. Zinc, Metal	37.4/lb.	44.6/lb.

chemicals, paints, explosives and in metallurgical applications in the manufacture of other metals (Table 9).

MINE PRODUCTION

U.S. Mines produced 336,504 tons of zinc in 1981, 9% less than the 369,122 tons in 1980 (Table 11). Strikes and mine closures contributed to lower production in a year when smelters experienced a tightness in concentrate supply. Bunker Hill Company closed its Idaho mines and smelter in November 1981, Gulf and Western Natural Resources Group announced the closing of zinc mines in Austinville, Virginia and Idol, Tennessee, citing high labor costs and depleting ore reserves but continued work to expand the Gordonsville, Tennessee zinc mine. Work also continued on the development of ASARCO's West Fork zinc-lead mine in Missouri and St. Joe's Pierrepont mine project in New York, both of which are scheduled to come on stream in 1985. The U.S. Bureau of Mines estimates that domestic mine production of zinc will increase by

TABLE 11. MINE PRODUCTION OF RECOVERABLE ZINC
(Tons of 2,000 lbs.)

	1980	(preliminary) 1981
Colorado	15,237	17,830
Idaho	30,558	35,170
Missouri	71,886	58,349
Montana	78	35
Nevada	2	5
New Jersey	31,811	17,856
New York	37,069	W
Pennsylvania	24,864	25,072
Tennessee	141,892	127,214
Virginia	13,270	10,222
Other States	2,455	44,751
Total	369,122	336,504

Source: U.S. Bureau of Mines

W Withheld to avoid disclosing company proprietary data, included in "Other States".

50,000 tons per year by 1985. Exxon Minerals Company permanently closed the Pinos Altos, New Mexico copper-zinc mine development project and postponed development of the Crandon, Wisconsin deposit. Noranda Sales Corp., Ltd. announced its preliminary studies of a silver-lead-zinc deposit in the Alaskan wilderness area not currently open to mineral development.

The U.S. Bureau of Mines estimates the current U.S. reserve base of zinc to be 48 million tons.

SMELTER PRODUCTION

In 1981, U.S. smelter production of slab zinc increased by 5% with smelters operating at 68% of combined capacity. Domestic smelters produced 376,780 tons of slab zinc in 1981, 18,171 tons more than the 1980 production of 358,609 tons (Table 1). Production of slab zinc according to grades is detailed in Table 12. Domestic shipments fell, however, by 10% from 399,588 tons in 1980 to 359,215 tons in 1981.

For the third year in a row, U.S. slab zinc smelting capacity was reduced. Bunker Hill Company's zinc smelter in Kellogg, Idaho, was shut down by Gulf Resources & Chemical of Houston because of losses

TABLE 12. U. S. PRODUCTION SLAB ZINC (PRIMARY & SECONDARY) BY GRADES

	1977	1978	1979	1980	1981
Special High Grade	166,685	198,209	190,790	163,565	121,995
High Grade	42,432	36,189	43,262	27,064	47,680
Continuous Galvanizing Grade	—	45,470	69,096	49,907	87,937
Controlled Lead Grade	—	28,023	44,444	20,558	16,766
Prime Western	282,454	178,748	231,884	146,597	70,951
Intermediate	9,184	—	—	—	—
Other Grades	—	—	—	—	31,451
Total	500,755	486,639	579,476	407,691	376,780

Source: U.S. Bureau of Mines and American Bureau of Metal Statistics.

due to low metal prices and shortage of smelter feed. The closure of Bunker Hill will reduce U.S. capacity by 104,000 tons per year and increase the U.S.'s reliance on imported zinc to meet consumption requirements. St. Joe Minerals Corp brought its Monaca, Pennsylvania zinc smelter back into production on a limited basis in 1981 and two other U.S. smelters brought on stream capacity increases. Primary zinc smelting capacity at year end 1981 was 420,000 tons per year, according to the U.S. Bureau of Mines, compared to 500,000 tons year end 1980.

1981 saw an increase in secondary zinc smelter capacity, with existing secondary plants adding capacity and two new smelters entering the business. Increased import reliance and concentrate shortages have encouraged the secondary market to recover more zinc, particularly through auto shredding.

Producer stocks at smelters increased 85% over 1981 from 20,564 tons year end 1980 to 38,129 tons year end 1981. (Tables 1 and 2). Stocks at smelters dropped slightly in the first half of 1981 and showed a steady increase in the second half of the year. Consumer stocks also increased in 1981 from 64,216 tons year end 1980 to 76,705 tons year end 1981, a ain of 19%. Producer stocks in locations other than smelters decreased, however, by 77% from 9,420 year end 1980 to 2,145 tons year end 1981.

No sales of zinc were made from the government stockpile managed by the Federal Emergency Management Agency. The stockpile goal remained at 1.43 million tons, of which 375,000 tons were on hand.

TABLE 13. U.S. SLAB CONSUMPTION BY GRADES
(Tons of 2,000 lbs.)

	1980	(preliminary) 1981
Special High Grade	390,568	354,954
High Grade	83,950	97,720
Continuous Galvanizing Grade	20,415	28,073
Controlled Lead Grade	77,504	79,117
Prime Western	319,947	268,666
Remelt	1,749	1,126
Total	894,133	829,656

Source: U.S. Bureau of Mines

PPreliminary—includes 12 month total, no annual figures.

IMPORTS & EXPORTS

Imports of zinc ores and concentrates for consumption rose 35% from 201,028 tons in 1980 to 270,847 tons in 1981. General imports of concentrate to warehouses fell 9% over the same period from 143,205 tons in 1980 to 129,782 tons in 1981 (Table 15). Major sources for ores and concentrates were Canada (46%), Peru (24%), Mexico (17%), Federal Republic of Germany (7%) and Honduras (4%).

Slab zinc imports both general and for consumption increased markedly in 1981. Imports of slab zinc for consumption increased 49% from 452,127 tons in 1980 to 674,621 tons in 1981. General imports went from 452,652 tons in 1980 to 664,356 tons in 1981, an increase of 47%. Sources for slab

TABLE 14. EXPORTS (DRAWBACK NOT INCLUDED)
(Tons of 2,000 lbs.)

	Slabs, Pigs & Blocks	Sheets, Plates, Strip or off forms N.E.S.*
1981	355	3,783
1980	333	3,407
1979	308	3,393
1978	852	2,680
1977	236	8,829

*Includes semifabricated forms N.E.S.

Source: Bureau of Census via American Bureau of Metal Statistics

zinc in 1981 were Canada (51%), Peru (7%), Spain (5%), Zaire (5%), Finland (5%) and Australia (4%).

Imports of slab zinc increased from over 75% of the source countries listed (Table 16). Significant increases were shown from Canada, Belgium-Luxembourg, Finland, France, Germany, F.R., Netherlands, Norway, Peru, Spain, The United Kingdom and Zaire. Imports of slab zinc decreased significantly from only two countries, Mexico and Algeria.

The U.S. continued to export a very small amount of zinc. Exports of slab zinc rose from 333 tons in 1980 to 355 tons in 1981. Exports of sheets, plates, strips and other forms not elsewhere specified went from 3,407 tons in 1980 to 3,783 tons in 1981 (Table 14).

TABLE 15. ZINC ORE GENERAL IMPORTS
(Tons of 2,000 lbs.)

	1977	1978	1979	1980	1981
Australia	4,343	2,041	779	1,623	996
Belgium	—	—	—	—	548
Bolivia	4,991	438	13,155	—	—
Canada	58,578	157,980	158,685	69,456	59,166
Chile	11,784	6,540	1,367	—	476
Colombia	18	11	17	16	6
Costa Rica	851	—	—	—	—
Germany, F.R.	812	7,204	8,598	2,670	9,576
Honduras	17,369	14,486	14,750	7,750	5,178
Mexico	4,289	2,879	17,867	17,405	22,094
Nicaragua	3,051	4,460	4	—	—
Peru	1,034	11,087	31,736	44,285	31,742
Thailand	15,688	—	—	—	—
Other Countries	—	111	2	—	—
Total	122,808	207,237	246,960(1)	143,205	129,782

(1) May not add to total because of independent rounding.

Source: U. S. Bureau of Mines

TABLE 16. SLAB ZINC GENERAL IMPORTS

	1977	1978	1979	1980	1981
Algeria	1,278	2,808	5,750	6,619	795
Australia	29,262	38,344	37,173	27,334	28,472
Austria	—	—	—	693	—
Belgium-Luxembourg	42,971	21,181	18,242	2,546	15,451
Brazil	—	—	—	—	1,646
Canada	239,555	288,631	286,096	308,726	340,223
Chile	—	—	—	—	1,598
China	1,109	883	229	1,346	1,646
Finland	32,669	36,337	23,244	14,251	32,140
France	17,427	25,159	14,818	13,269	19,710
Germany	42,552	40,736	21,064	13,289	25,151
Italy	21,602	12,290	6,054	2,204	8,405
Japan	14,353	9,485	11,152	—	7,817
Korea, Republic of	—	4,409	2,535	7,174	22,285
Mexico	29,981	56,737	43,357	26,300	16,638
Netherlands	6,424	11,130	3,504	7,174	22,285
Norway	—	—	—	—	11,906
Peru	18,885	11,293	8,150	4,354	47,772
Poland	3,941	6,250	110	—	—
South Africa	5,885	8,942	—	—	—
Spain	28,339	66,387	73,567	11,825	31,605
Tanzania	—	—	—	1,133	—
United Kingdom	1,643	1,099	2,626	4,533	14,637
Yugoslavia	3,574	4,163	—	—	1,101
Zaire	35,707	28,252	16,402	—	31,460
Zambia	579	2,870	5,518	5,513	415
Other	—	3,665	1,554	—	1,829
Total	577,736	681,051	581,145 (1)	458,283	684,987

(1) Total may not add because of independent rounding.

Source: U.S. Bureau of Mines.

ZINC MARKET OUTLOOK

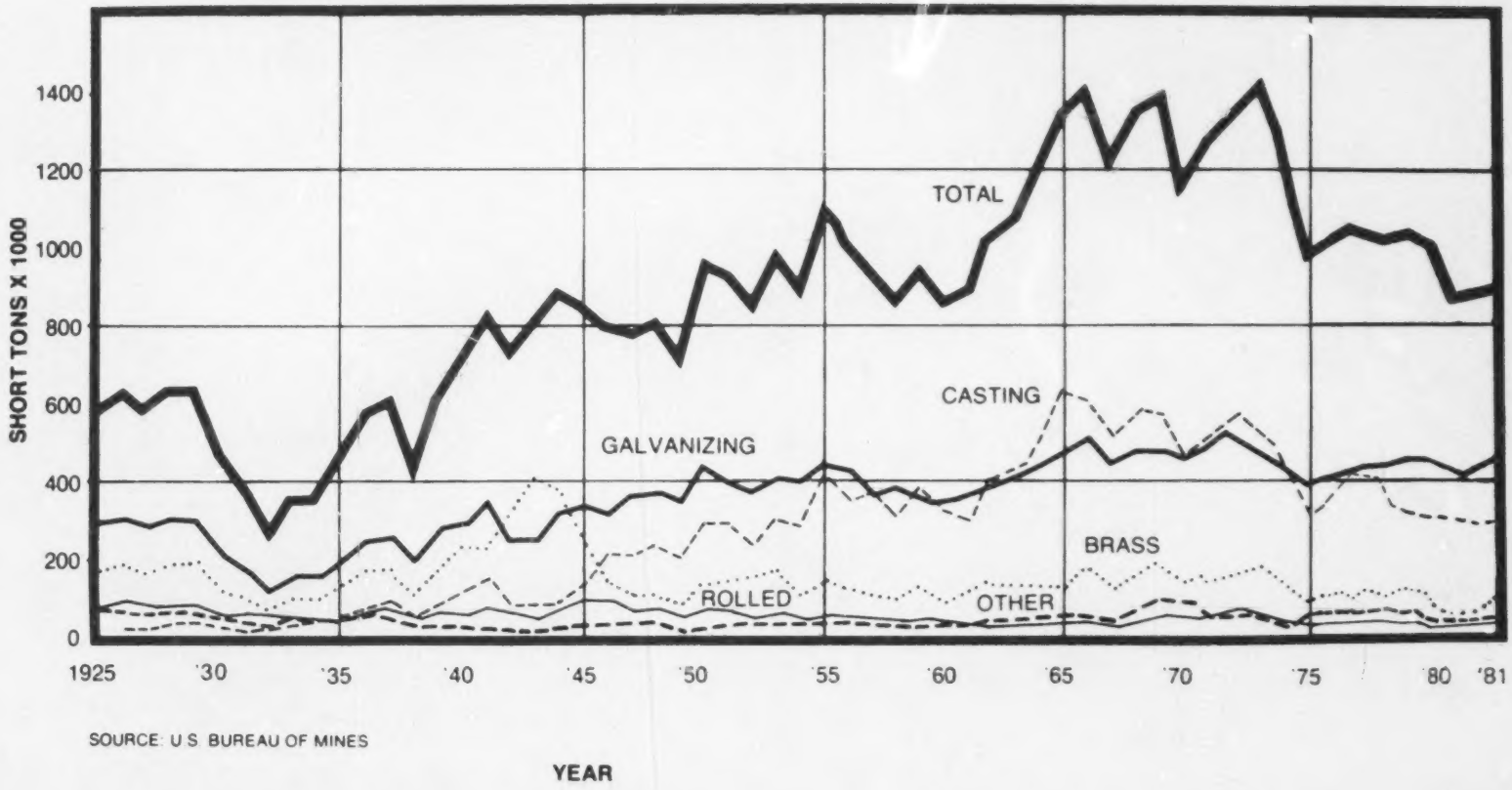
Economic forecasters see the U.S. economy recovering slowly from the 1981 recession with improvement stretching into 1983. The first quarter of 1982 brought little improvement in business levels necessary for recovery. The consensus of economic opinion ties improved business levels, particularly in the construction and auto industries, to lower interest rates. A general economic upturn is forecast for the last two quarters of 1982 with a rise in domestic auto production and an upturn in the steel industry.

The introduction in early 1982 of the zinc alloy penny by the U.S. Mint will add 50,000 tons in 1983 with an 8% annual growth thereafter. By the end of 1982 all four U.S. Mint facilities will have converted from copper to zinc alloy one-cent pieces. The switch to zinc came about due to a number of factors including the cost effectiveness of zinc relative to copper. Other countries' minting facilities are looking at the possibility for zinc coins and usage of rolled zinc could also increase with zinc tokens.

The tremendous cost of corrosion to the U.S., estimated by the National Bureau of Standards to be $70 billion a year, has increased consumer and industry awareness of product durability. Therefore, national emphasis

CONSUMPTION OF SLAB ZINC IN THE UNITED STATES

(1925–1981)



SOURCE: U.S. BUREAU OF MINES

on increased life and durability of products will have a strong favorable impact on the zinc coatings market initially for all end uses. The automotive industry, recognizing the need for more protection, has increased the use of continuously galvanized steel sheet and zinc coated steel parts each year. As mentioned earlier, this marketplace has yet to show its full potential, partly because of the depressed state of the auto industry in the U.S. The shift to increased use of thinner high strength steels on auto bodies increases the need for corrosion protection with zinc coatings. The same considerations are leading designers of appliances and industrial products to use galvanized steel stampings in their products, allowing the elimination of costly paint lines.

Use of continuously galvanized steel sheet should continue to expand in the housing and commercial construction markets. Cost comparison studies have shown that galvanized steel framing will save money over the cost of traditional materials such as lumber and masonry. Steel framing can save up to 20% in the cost of labor and materials compared to wood. This explains why zinc-coated steel framing has increased significantly in the past two years, despite the depressed state of the housing industry. Housing starts in 1981 were one million units, down from the 1.2 million starts of 1980 and a far cry from the 2 million housing starts in 1978. It will take lower interest rates and improved availability of money to have a dramatic impact on this market and release pent-up demand. It is going to happen, and with it will come greater gains for galvanized steel. While no one seems to know when, there is general agreement that the trigger is a prime interest rate in the 12-14% range.

A major concern to the zinc producing industry has been the growth in capacity and use of Galvalume®, a coated steel sheet, containing 55% aluminum and 45% zinc. Galvalume® initially replaced aluminized steel in roofing applications for pre-engineered buildings but has now begun to threaten galvanized steel markets for metal building walls and other applications. So far, pre-painted galvanized steel has managed to withstand the introduction of Galvalume® into this marketplace. The metal building market is one which is expected to expand further because of faster construction and overall savings in cost of material, labor and financing.

The introduction of the coating product Galfan® is expected to curtail (in the long run) losses in the galvanized steel sheet market to Galvalume.® Galfan®, a 95% zinc/5% aluminum alloy coating, offers better formability and weldability over a wider range of coating thicknesses along with superior edge rust protection and paintability. Galfan® also requires less energy and can be used with only minor modifications to existing galvanizing lines. Potential markets for Galfan® are in metal buildings, fencing, roofing, wire, agricultural equipment and guard rails. The first commercial production of Galfan® will begin in Europe in 1982.

Electric utilities has been the strongest market for hot dip galvanizing after fabrication in recent years to protect transmission, generating and distribution equipment. Good market growth potential exists in both light and heavy construction as well as in transportation markets, especially bridges. The range of applications goes from small threaded fasteners to large river-spanning bridges.

Zinc consumed for corrosion protection is also expected to increase in markets using metallizing (thermal spraying) and zinc-rich paints.

While die casting markets have suffered from substitution of materials in past years, improvements in zinc die casting technology have now resulted in an increased number of applications with ThinWall technology. Decreasing use of zinc die casting in automotive markets has bottomed out in the last two years with some new automotive applications. Zinc die cast parts have seen increased usage in builder's hardware, appliances, and commercial equipment to counteract the decline in auto usage. The hardware market will show substantial growth with an improvement in housing starts. Appliance markets, which showed a 3% increase in shipments in 1981, will also grow with housing starts. New applications are evolving in commercial equipment markets based on introduction of ThinWall technology.

The new line of zinc foundry alloys offers a great potential to replace iron, bronze, brass and aluminum in many applications by offering greater strength, improved bearing properties and reduced costs.

Growth markets are also seen for use of zinc dust in anti-corrosive coatings for auto, marine and heavy duty maintenance applications. Zinc oxide markets will also show improvement with increased auto production fueling demand for tires. Zincrometal® is extensively used in the automotive industry and is a signficant example of the use of zinc dust for corrosion protection. Zinc rich paints consume zinc dust for a wide variety of outdoor structures, including bridges and industrial equipment.

Overall, steady growth is projected for major zinc markets based on the strong demand for corrosion resistance and new engineering materials.

ZINC PRICES

The average price of high grade zinc for 1981 was 44.6¢/lb., a 19% increase over the 1980 average of 37.4¢/lb. In 1980 the domestic zinc industry changed its pricing structure to use high grade as the bellwether grade instead of Prime Western. U.S. zinc prices began 1981 at 41.25¢/lb. and began a steady rise in April starting at 43.25¢/lb. to the yearly high of 49.25¢/lb. in August. Prices softened in October to 46.35¢/lb., ending the year at 42¢/lb.

Average monthly zinc prices on the London Metal Exchange rose steadily through August, from a low in January of £323/mt (35.2¢/lb.) to £524/mt (43.2¢/lb.), afterwards decreasing to a year end price of £443.7/mt (38.3¢/lb.).

European Producer Prices for zinc ranged from a low of $825/mt (37.4¢/lb.) in early 1981, to a high of $1,000/mt (45.36¢/lb.) in August, closing the year at $950/mt (43.09¢/lb.).

ILZRO ZINC/CADMIUM RESEARCH—1981

The introduction of Galfan, a zinc-5% aluminum galvanizing alloy, was the highlight of ILZRO zinc/cadmium research and development achievements in 1981. The Galfan coating system was announced to the world following conclusion of a full-scale production run at the Ziegler S.A. works in Mouzon, France, and the successful completion of three

pilot run trials by the ILZRO contractor, Centre de Recherches Metallurgiques (CRM) in Liege, Belgium.

Intensive salt spray and sulfur dioxide corrosion tests indicate that the new alloy offers protection from corrosion that is from two to four times better than that given by conventional galvanized coatings. Additionally, Galfan offers superior edge and scratch protection, unlike other zinc-aluminum galvanizing alloys. Applicable in virtually any thickness, from around 0.0005 to around 0.002 in. (G-90), Galfan has superior ductility that permits it to be formed into very complex shapes, without cracking. Among Galfan's other major benefits is the fact that no major capital expenditures are required to put the alloy into production, provided the galvanizer already has a cast iron pot or ceramic kettle. Further savings result from the fact that the Galfan bath operates at about 430°C (806°F), compared with 450°C (842°F) for conventional galvanizing and 600°C (1112°F) for the competitive 55% aluminum-43.4% zinc-1.6% silicon alloy.

In other galvanizing developments, ILZRO directed much attention to the use of galvanized reinforcement in concrete, which previous ILZRO research had proved technically sound and economically viable. A significant and unexpected finding came late in the year with the announcement by the University of Sydney, Australia, that under fatigue testing, corrosion of deformed epoxy-coated steel rebar becomes apparent at the lugs. This ILZRO research included testing of galvanized and black steel rebar under similar conditions to obtain sound data for use by engineers in designing offshore concrete structures, which are subject to fatigue loading and adverse environmental conditions.

In the die casting area, further advances in process technology were scored during the year, particularly in movement toward development of a heated manifold, direct injection feed system for hot-chamber zinc die casting machines. In cooperative efforts with the Zinc Institute, some revisions were made to the computer-aided design program for designing metal feed and overflow systems for zinc die casting dies. Four computer programs have been made available to industry, the other three covering waterline placement, cost estimating and analysis. (CACE-A) and calculation of weights and volumes of a zinc die casting.

Further significant developments were posted in the ILZRO effort to find new uses for zinc and to defend existing zinc applications through engineering design or redesign of components in zinc. Originally aimed at the automotive market, the project now deals with all aspects of zinc—castings, wrought and galvanized—in all types of markets, including appliances, hardware, and electronics. Through 1981, more than 70 individual applications had been studied.

In other zinc research, progress was achieved in developing of further data on ILZRO's foundry alloy 12 and other zinc-based alloys; publication of a manual summarizing ILZRO research which demonstrated the effectiveness of zinc oxide/synergist systems as weathering stabilizers in plastics; development of necessary equipment modifications to permit early adaptation of the pore-free die casting method to zinc die casting (it is also applicable to die casting of lead battery components); and new application methods to apply previously developed phosphate paint

pretreatments to cold-rolled steel, galvanized steel, aluminum, or to welded joints of two or more of these materials in so-called "coach joints."

ILZRO's many contributions to the die casting industry were recognized in the granting of the Doehler Award to Dr. S.F. Radtke, ILZRO President, by the American Die Casting Institute at its annual meeting in Chicago on September 18. The award cited ILZRO's achievements in new plating techniques, ThinWall zinc die casting technnology, and computer-aided die design, among other advances.

In cadmium work, ILZRO's research on the method of test and permissible limits of lead or cadmium release from ceramic ware in contact with food was successfully climaxed with issuance of two International Standards Organization specifications, ISO 6486/1 and 6486/2. These standards will help to preserve the multimillion dollar market for cadmium colorants in ceramic glazes while providing protection to consumers against heavy metal poisoning. Meanwhile, research to identify the mechanisms of cadmium and lead release is continuing so that safe glazes can be designed.

Also in the cadmium area, the Third International Cadmium Conference on environmental health and market applications was held in Miami, Florida, in February, under the joint sponsorship of ILZRO, the Cadmium Association, London, and the Cadmium Council, New York. The three sponsoring organizations also cooperated in publishing the conference Proceedings, which were available for distribution by early 1982.

ZINC IN ASIA 1981

J. H. McAuliffe, Director
Lead and Zinc Asian Service
Melbourne, Australia

ESTIMATES OF CONSUMPTION

End Use	1981
Galvanizing	
General	17,000
Sheet	82,000
Pipe	52,000
Wire	11,000
Total	162,000
Brass	24,000
Diecasting	63,500
Dry Cells	51,500
Zinc Dust	3,000
Zinc Oxide	16,000
Miscellaneous	5,000
Grand Total	324,000

Estimates of primary and secondary zinc consumption cover South Korea, Taiwan, Hong Kong, Philippines, Malaysia, Singapore, Thailand and Indonesia.

Zinc consumption is mainly accounted for in galvanizing (steel sheet, pipe, structural steel parts) reflecting infrastructural development and construction occurring within this growing region, and in the diecasting and battery sectors.

ZINC IN AUSTRALIA 1981

Mr. C. J. Bain, Director
Australian Zinc Development Association
Melbourne, Australia

Australian primary zinc sales in 1981 were 91,364 tonnes, a decrease of 3.9% from 1980 sales of 95,018.

PRIMARY ZINC SALES IN AUSTRALIA BY END USES
(Metric Tons)

End Use	1980	1981
Galvanizing		
General	15,126	16,464
Sheet	34,754	29,351
Wire	7,583	6,713
Pipe & Tubes	10,212	7,926
Total	67,675	60,454
Brass	7,574	9,299
Diecasting	8,479	8,718
Rolled Zinc	2,444	1,941
Zinc Dust	2,571	2,698
Zinc Oxide	3,991	4,978
Miscellaneous	2,284	3,276
Total	27,343	30,910
Grand Total	95,018	91,364

Zinc sales showed a decrease in all galvanizing end use areas, except general galvanizing, reflecting the depressed condition of the domestic and commercial building sector, and agricultural industry. Sales for general galvanizing again showed strong growth, but were lower than expected due to the deferment and/or slippage of major construction projects.

Zinc sales to the general galvanizing industry from 1975 to 1980 are listed below and show the dramatic growth that has occurred in this end use sector over the period.

	Tonnes	% Increase
1975	9,541	—
1976	10,130	+ 6.2
1977	10,838	+ 7.0
1978	11,840	+ 9.3
1979	13,126	+10.9
1980	15,126	+15.2
1981	16,464	+ 8.9

ZINC IN BELGIUM/LUXEMBOURG 1981

J. Pelerin
Zinforbel
Lieges, Belgium

BELGIAN ZINC STATISTICS
(Metric Tons)

	1979	1980	1981
Production	253,000	247,000	235,000
+ Imports	51,000	46,000	40,000
− Exports	194,000	168,000	n.a.
Apparent Consumption	110,000	125,000	n.a.

n.a. not available

ZINC IN CANADA 1981

M.J. Gauvin
Energy, Mines and Resources Canada
Ottawa, Ontario

The Canadian zinc industry was markedly affected by the recessionary trend of world economics during 1981. Canada is the world's largest producer and exporter of zinc and about 25 per cent of Western world demand is supplied by Canadian mines. Canadian zinc refinery capacity in 1981 was 648,000 tonnes. Three of the refineries are in the process of adding incremental increases to their capacities which will add 55,000 tonnes to the total capacity by 1984. Brunswick Mining and Smelting Corporation Limited announced a joint project with Heath Steele Mines Limited to build a 100,000 tonne a year zinc reduction plant at Belledune, New Brunswick. Construction is scheduled to start in 1982 with completion targeted for late 1984. Both mine and metal production increased in 1981 from 1980 when production was down because of numerous production interruptions.

Consumption in 1981 as measured by producers' shipments to domestic consumers was 131,859, almost unchanged from 1980.

CANADIAN ZINC PRODUCTION AND SHIPMENTS
(Metric Tonnes)

	Production		Shipments (Refined Primary Metal)			
Year	Mine Output	Refined Primary Metal	Within Canada	To U.S.A.	To Other Countries	Total
1974	1,206,856	437,725	134,629	238,615	58,162	431,406
1975	1,229,479	426,902[r]	149,214[r]	161,599	85,874	396,687
1976	1,145,013	472,316	133,561[r]	274,448	77,623	485,632
1977	1,300,228	494,938	120,727[r]	207,374	87,984	416,085
1978	1,245,248	495,243	144,740	259,396	179,864	584,000
1979	1,204,401	580,449	153,744	262,002	167,350	583,096
1980	1,058,714	591,565	132,543	278,226	193,723	604,492
1981[p]	1,094,027	618,650	131,859	304,443	149,089	585,391

[r]revised; [p]preliminary

CANADIAN CONSUMPTION OF PRIMARY ZINC
(Metric Tonnes)

Year	Galvanizing	Casting	Brass	Other	Total
1974	63,500	27,700	14,000	21,800	127,000
1975	58,900	24,100	9,100	18,800	110,900
1976	59,900	26,100	11,300	20,300	117,600
1977	61,700	25,400	11,800	20,800	119,700
1978	69,887	12,081	13,477	21,924	117,369
1979	75,761	16,540	11,587	23,692	127,580
1980	69,698	17,721	11,308	48,628	147,355
1981[p]	n.a.	n.a.	n.a.	n.a.	145,500[e]

[p]preliminary data
[r]revised
[e]estimated
n.a. Not available

Data from 1974 to 1977 inclusive are Zinc Institute estimates.
Data from 1978 are from Statistics Canada and Energy, Mines and Resources Canada and do not include a number of small consumers.

ZINC IN THE FEDERAL REPUBLIC OF GERMANY 1981

H. Johnen
Zinkberatung e.V.
Düsseldorf, Federal Republic of Germany

Estimated zinc consumption for 1981 will be slightly lower than 1980.

A significant decrease in consumption in the second half of 1980, continuing into early 1981, reduced both production and consumption. We look for an increase in consumption in 1982 but the poor start in 1981 can only be compensated with difficulty by an improved second half.

PRODUCTION, IMPORTS AND EXPORTS
(Metric Tons)

	1977	1978	1979	1980	(Est.) 1981
1. Zinc Production	354,777	306,836	355,523	365,203	370,000
2. Imports	118,779	130,864	142,383	141,154	120,000
3. Exports	115,985	75,286	82,856	98,203	113,000
4. Balance (1+2−3)	357,571	362,414	415,050	408,154	377,000
5. Secondary Zinc	18,653	18,157	21,858	27,849	36,000

MANUFACTURING AND AUTO PRODUCTION
(Metric Tons)

	1977	1978	1979	1980	(Est.) 1981
6. Alloys	95,899	90,628	93,021	87,922	76,000
7. Reported metal castings	49,919	51,435	51,697	47,082	43,000
8. Automobile production	4,100,000	4,250,000	4,300,000	3,880,000	3,900,000

WROUGHT ZINC FOR BATTERIES, PRINTING PLATES AND ZINC IN BUILDINGS
(Metric Tons)

9. Wrought	55,937	57,678	60,838	63,878	67,000
10. Imports	16,715	23,227	24,019	25,673	26,000
11. Exports	12,913	12,526	15,015	16,203	16,000
12. Balance (10-11)	3,802	9,701	9,004	9,470	10,000

CONSUMPTION
(Metric Tons)

	1977	1978	1979	1980	(Est.) 1981
13. Stocks January 1	82,773	93,334	76,738	69,679	71,121
14. December 31	93,334	76,783	69,679	71,121	60,000
15. Change-Increase	10,561	—	—	1,442	—
16. Change + Decrease	—	16,551	7,059	—	11,000
17. 4+5+12+16−15= Consumption	369,465	406,823	452,971	444,031	434,000

CONSUMPTION OF ZINC BY END-USE
(Metric Tons)

	1977	1978	1979	1980	(Est.) 1981
18. Brass	99,600	105,400	103,500	107,900	100,000
19. Galvanizing:					
Sheets	60,500	62,300	72,400	67,600	68,000
Pipes	15,900	17,000	9,900	6,000	6,000
Wire	10,000	10,100	10,800	9,700	10,000
General Galvanizing	54,500	57,000	69,900	73,000	75,000
20. Wrought zinc	55,900	57,700	60,900	63,900	67,000
21. Zinc Oxide	6,500	6,100	14,300	15,000	14,000
22. Alloys	85,600	77,600	85,000	82,100	74,000
23. Other	1,800	2,300	3,000	2,900	3,000
24. Misc	800	1,100	800	700	1,000
Total	391,100	396,600	430,500	428,800	418,000

ZINC IN FINLAND 1981

(As Reported by Outokumpu Oy)
Helsinki, Finland

CONSUMPTION OF SLAB ZINC BY END USERS IN FINLAND
(Metric Tons)

	1979	1980	1981
Galvanizing			
General	3,500	4,500	4,350
Sheet	12,190	12,700	11,720
Wire	830	840	700
Total	16,520	18,040	16,770
Brass	3,000	3,000	3,000
Diecasting	900	1,000	690
Others	2,600	2,700	3,540
Total	6,500	6,700	7,230
Grand Total	23,020	24,740	24,000

Consumption of zinc in 1981 decreased by 3% compared with 1980. The total consumption was 24,000 tons.

ZINC IN FRANCE 1981

Ph. de Puyraimond
Centre Technique du Zinc et de ses Alliages
Levallois, France

Apparent consumption of zinc from all sources, at the first stage of transformation diminished markedly in 1981, amounting to 273,542 tons against 331,353 tons in 1980 (this tonnage includes precautionary purchases made by the French government).

The drop is partially due to the pre-electoral wait-and-see policy that lead certain producers and users to drastically cut into their stocks (the automobile industry, suffering, also cut down purchases).

The market of nonferrous metals showed no real improvement during the last months of 1981, in the perspective of a general recession and with the expectation of a decrease in interest rates, especially in the U.S.

In spite of the hopes at the end of 1980 that would have had the price of zinc rise, the quotations at the London Metal Exchange were led to decrease in sympathy with the other metals.

Furthermore, the weakness of the pound compared to the dollar contributed to the widening of the gap between the L.M.E. price and the European producers price.

The tendency toward an increase of primed nonferrous metals during March was confirmed in April. At the initiative of Canadian producers, the G.O.B. European producers price was raised from $825 per ton to $875. This official price was published April 9th—the preceeding price had remained unchanged since October 16th, 1980. On May 15th, 1981, it attained $925 and rose to $1000 on September 1st. The price dropped to $950 at the beginning of December.

FRENCH RAW SLAB ZINC PRODUCTION
(Metric Tons)

Raw slab zinc production totalled 257,132 tons in 1981, 4,356 tons more than in 1980 and 4,160 tons more than in 1979.

	1979	1980	1981
Pure and Extra Pure Zinc.....	182,398	188,865	193,030
Ordinary Zinc	66,218	63,911	64,102
	248,616	252,776	257,132

FRENCH RAW SLAB ZINC CONSUMPTION
(Metric Tons)

The evolution of French consumption of Raw Slab Zinc over the past three years is illustrated in the following table:

	1979	1980	1981
Production	248,616	252,776	257,132
+ Imports	79,386	105,068	61,835
	328,002	357,844	318,967
− Exports	39,715	26,491	45,425
Apparent French Consumption	288,287	331,353	273,542
nsumption decrease and incidence of the increase of production stocks	− 1,548	− 1,381	− 1,396
	286,739	329,972	272,146

It is to be noted that the General Management of the Customs Department mistakenly registered under the item "Zinc Alloys" certain tonnages of zinc containing a very small amount of aluminum and which, therefore, are not included in the above figures; they should, however, be taken into account and French consumption should be increased as follows:

− 1,700 tons in 1979
− 2,001 tons in 1980
− 1,295 tons in 1981

DISTRIBUTION TO USERS (FRENCH PRODUCTION)

	1979		1980		1981	
	ton	%	ton	%	ton	%
Rolled Zinc	108,189	37.73	108,588	32.9	102,014	37.5
Galvanizing	97,961[1]	34.16	94,133[2]	28.6	97,603[5]	35.9
Alloys [3]	33,736	11.77	35,099	10.6	25,202	9.3
Brass [3]	25,030	8.73	31,814	9.6	22,032	8.1
Oxides [4]	7,340	2.56	14,159	4.3	8,707	3.2
Wire	5,601	1.95	5,699	1.7	5,847	2.1
Miscellaneous	8,882	3.10	40,480	12.3	10,738	3.9
	286,739	100%	329,972	100%	272,143	100%

1) This figure is to be increased by 1,700 tons for the above reasons.
2) The increase for 1980 amounts to 2,001 tons.
3) Zinc content.
4) It should be noted that raw zinc is only one of the raw materials used for zinc oxide production which amounted to 42,364 tons in 1981 compared to 51,141 tons in 1980 and 45,416 tons in 1979.
5) The increase for 1981 amounts to 1,295 tons.

FRENCH CONSUMPTION OF ROLLED ZINC
(Metric Tons)

French consumption of rolled zinc over the past three years can be illustrated as follows:

	1979	1980	1981
Production	106,017	106,245	99,059
+ Imports	13,590	13,336	14,160
	119,607	119,581	113,219
– Exports	39,797	41,321	36,706
Apparent French Consumption	79,810	78,260	76,513
Production decrease and incidence of the increase of stocks	– 5,137	– 731	– 241
	74,673	77,529	76,754

French consumption of rolled zinc diminished slightly in 1981 (77 tons less) compared to 1980.

The building industry is still the biggest sector for rolled zinc; the proportion of "building" in "building and industry" is still higher than 85%.

1979	1980	1981
85.94%	86.60%	88.73%

Galvanizing

The French galvanizing industry consumed 103,300 tons against 103,500 tons in 1980 and 98,900 tons in 1979. The figures include only hot dip galvanizing, first and second melting.

The breakdown of the tonnage consumed can be approximately established as follows:

FRENCH CONSUMPTION OF ZINC IN GALVANIZING
(Metric Tons)

	In tons		
	1979	1980	1981
Sheets	45,200	48,900	50,000
Tubes	5,000	3,700	3,700
Wire	14,200	16,900	17,000
General	33,600	34,000	32,600

Galvanized Strip

For the French galvanized strip industry, 1981 was marked by the implementation of controls of the activity of manufacturers of steel products of the CECA, affected by the European Commission.

The results of this sector can be followed with the below indications, which include galvanized sheets and narrow strip as well as precoated sheets and strip.

FRENCH GALVANIZED STRIP PRODUCTION
(Thousands of Metric Tons)

	1976	1977	1978	1979	1980	1981	1981/1980
French production	702	734	851	966	999	1,012	+ 1.3%
French consumption	586	632	641	733	831	780	− 6.1%
Imports	156	177	183	202	228	211	− 7.5%

After having continuously progressed from 1976 to 1980, apparent consumption shrunk in 1981 under the effects of the Community reduction measures, which applied to French deliveries as well as imports.

FRENCH GALVANIZED AND PRECOATED PRODUCTS
(Thousands of Metric Tons)

The following table shows the evolution of French deliveries of both galvanized and precoated strip in 1979, 1980 and 1981, along with the main categories of clients.

	Galvanized			Precoated		
	1979	1980	1981	1979	1980	1981
Ironmongers	155	190	164	8	15	15
Ripped strip	65	53	52	9	9	8
Construction	130	133	116	82	114	123
Automobile	18	17	15	1	3	3
Mechanics	8	8	7	5	6	6
Appliances	9	11	9	1	2	2
Agricultural	4	4	2	—	—	—
Miscellaneous	31	32	42	5	5	5
	420	448	407	111	154	162

Deliveries of galvanized sheets to ironmongers have diminished by 14% from 1980 to 1981 while precoated sheets have remained steady. Because of the mediocre situation in the construction industry deliveries of galvanized sheets diminished, but this decline is offset by the progress in precoated sheets. Supplies to other categories of clients have not greatly varied. The slight drop in the automobile sector must be interpreted within the context of the strong progress of sheets coated with zinc in other ways, for which the figures are not included above. From 1980 to 1981, French deliveries of electrozinc rose by 19%, sheets coated with zinc primer (Zincrometal) were up by 150%, and sheets galvanized on only one side have tripled.

Galvanized Tubes

Deliveries of galvanized tubes amounted to 38,700 tons in 1981 compared to 42,500 tons in 1980, which means a decrease of 8.9%. The drop from 1979 to 1980 was 9.6%.

The proportion of galvanized tubes in the total sum of tubes in the same class (gas welded tubes) was 42.1% compared to 38.5% in 1980 and 37.6% in 1979. For exports the proportion was 57.5% compared to 47.1% in 1980 and 50.8% in 1979.

Galvanized Wire

Soft Steel

Deliveries of soft steel for galvanized wire amounted to 123,000 in 1981. A slight decrease must be noted in 1981 deliveries compared to 1980 (125,000 tons).

Galvanized Fencing (all categories)

Deliveries totalled 99,000 tons as opposed to 108,000 tons in 1980.

Barbed Wire

Deliveries amounted to 22,000 tons for 1981.

Hard Steel

Deliveries of hard steel wire amounted to 31,000 tons in 1981.

The total of galvanized products was 275,000 tons in 1981 compared to 265,000 tons, meaning a 4% increase from the preceeding year.

General Galvanizing (Jobbing)

Tonnage of general galvanizing decreased slightly in 1981 (32,600 tons in 1981 as opposed to 34,000 tons in 1980).

Jobbing galvanizers are very concerned with the development of their trade and some have even carried out market studies in order to pinpoint the sectors that could use the advantages of galvanized steel in the near future.

Furthermore, French producers and the C.T.Z. organized an advertising campaign that received a press award. These efforts will continue in 1982 with a larger number of advertisements.

Alloys

The consumption of zinc alloys diminished on the French market in 1981 as it attained 47,000 tons compared to 50,060 tons in 1980.

Zamak represents the largest part of this market as it amounted to 46,126 tons.

A statistical survey carried out every two years to determine the principal markets of components cast in zinc alloy shows the following distribution:

Markets	in %
Automobile	31.83
Hardware	18.00
Toys-Sports	10.06
Appliances	9.80
Electricity	8.41
Clothes	5.34
Mechanics	4.83
Audio-Visual/Optical	2.17
Transports (except auto)	1.21
Miscellaneous	8.35

The figures reflect the level of industrial activity of the different industries concerned. A stagnation or a drop is noted except for toys which rose 28% from 1979 (the year of the last survey) to 1981.

This analysis in no way indicates a dropping off of users in any area of activity whatsoever.

We look back with envy at the 8% annual rate of increase which was noted from 1950 to 1975.

A renewal of industrial production in the key sectors—automobile, construction, appliances—would bring immediate advantages to zinc alloys. They could also be favored by the probable increase of the cost of the main competitor's materials.

For KAYEM and ILZRO 12 alloys, French consumption continues on the same level. It reached 845 tons compared to 860 tons in 1980.

Brass

French production of semi-finished products in brass, for the year of 1981, with the indication of percentages of the evolution from the preceeding year, amounted to 156,200 tons compared to 1,777,270 tons in 1980.

FRENCH CAST BRASS PRODUCTION

	1980		1981	
	Tons	%	Tons	%
Rolled Brass	39,250	− 4%	36,900	− 6%
Brass Wire.....	9,560	+ 7%	8,700	− 9%
Brass Bars	124,750	+ 9%	106,300	−15%
Brass Tubes.....	3,710	−36%	4,300	+16%

The consumption of cast brass amounted to approximately 4,600 tons compared to 4,800 tons in 1980.

Zinc Wire

Zinc wire production amounted to 5,994 tons compared to 4,800 tons the year before.

Zinc Dust

Zinc dust production amounted to 9,252 tons in 1981 as opposed to 8,395 tons in 1980 and 8,794 tons in 1979.

Zinc Oxides

Deliveries of zinc oxides totalled 8,707 tons as opposed to 14,159 tons in 1980 and 7,340 tons in 1979.

This decrease was caused by the drop in consumption in the tire industry. Promotional efforts will be undertaken in this area.

ZINC IN INDIA 1981

V.K. Sudhakaran, Secretary
Indian Lead Zinc Information Centre
New Delhi, India

Domestic zinc production in India during 1981 was 57,400 tonnes. The Debari and Vizag smelters of the State-owned Hindustan Zinc Ltd. produced 48,600 tonnes of zinc during the year and the remainder (8800 tonnes) was the share of Cominco Binani Zinc Ltd—the private sector zinc smelter whose plant was under lockout for over 9 months in 1980. Shortage of power continued to plague the Hindustan Zinc smelters and their production loss in 1981 is estimated at over 10,000 tonnes of zinc ingots.

Preliminary estimates indicate that zinc imports in 1981 were of the order of 65,000 tonnes.

Zinc consumption during 1981 has been tentatively placed at around 120,000 tonnes and the break up of consumption, end use-wise, was as follows:

Galvanizing	60%
Batteries	16%
Alloys	10%
Chemicals	7%
Diecastings	3%
Others	4%

The lull in construction activity continued throughout the year mainly because of the acute shortage of cement and this in turn led to a fall in home market demand for galvanized structurals and tubes. However, exports of galvanized tubes and wires looked up during the year. What with plans for rapid electrification of railroads between the four metropolitan cities of New Delhi, Bombay, Madras and Calcutta and a new 200,000 tpy continuous sheet galvanizing line getting ready for commissioning during 1982, zinc consumption by the galvanizing sector will register a significant growth in the coming years.

Hindustan Zinc Ltd is going ahead with the project to set up a composite lead/zinc smelter of 135,000 tpy—100,000 tpy zinc and 35,000 tpy lead—at the Bhilwara district of Rajasthan. The smelter will be based on the Rampura-Agucha ore deposits. The pre-feasibility study for the project is being made and the smelter is scheduled for commissioning by 1985. However, given the infrastructural imbalances which have been plaguing the economy, even after the new capacity has gone on stream, India might continue to be a net importer of zinc.

ZINC IN JAPAN 1981

Haroshi Tanaka, Director General
Japan Lead Zinc Development Association
Tokyo, Japan

Japan is the largest producer of slab zinc in the free world. The production in 1981 was 670,000 metric tons, about 69,000 tons down compared with the previous year, due to the worldwide business dull.

PRODUCTION OF SLAB ZINC
(in 1,000 Metric Tons)

1977	1978	1979	1980	1981
778	768	789	739	670

In 1981, the consumption of zinc decreased by 44,000 metric tons compared with 1980.

The economic depression affected all uses except zinc die casting, which was slightly up on 1981.

CONSUMPTION OF SLAB ZINC
(in 1,000 Metric Tons)

Uses	1977	1978	1979	1980	1981
Sheet galvanizing	265	298	319	302	272
General galvanizing	106	115	123	122	114
Brass, bronze, etc.	92	99	99	101	94
Die Casting	112	106	119	118	121
Others	92	98	94	88	86
Total	667	716	754	731	687

ZINC IN THE REPUBLIC OF SOUTH AFRICA 1980 AND 1981

Zinc Corporation of South Africa Ltd.
Struisbult Springs, Republic of South Africa

Production in 1981 showed a slight decrease on 1980 at 80,941 metric tons but imports increased considerably at 5,741 metric tons.

A decision was made to increase the capacity of the electrolytic smelter at Zinc Corporation of S.A. Limited to 105,000 metric tons and this should be available for early 1983.

	1980	1981
Production: (Metric Tons)	81,350	80,941
Imports	3,850	5,741
Consumption of Zinc		
Galvanizing	61,129	66,606
Sheet	30,259	34,768
Jobbing	13,204	15,785
Wire	12,104	9,724
Pipe	5,562	6,329
Copper-Zinc Alloys	8,909	4,716
Zinc-Aluminum Alloys	4,950	5,378
Rolled Zinc	2,500	2,896
Zn0 and Zn dust	5,007	3,144

ZINC IN SPAIN 1981

V. R. Peña, Director
Asociacion Tecnica Española Para el Desarrollo del Zinc
Madrid, Spain

The production of zinc in Spain during 1981 rose to 179,497 metric tons, thus showing an increase of 27,764 tonnes (+ 18.3%) when compared with the previous year.

PRODUCTION OF SLAB ZINC
(Metric Tons)

	1980	%	1981	%	% change in 1981 over 1980
Pure and extrapure zinc	143,631	94.6	172,357	96.0	+ 20.0
Ordinary zinc	8,102	5.4	7,140	4.0	− 11.9
	151,733	100.0	179,497	100.0	+ 18.3

CONSUMPTION OF SLAB ZINC BY END-USE
(Metric Tons)

USES	1980	%	1981	%	% change in 1981 over 1980
Galvanizing					
General	13,824	15.2	12,941	14.2	− 6.4
Tube	8,335	9.1	8,497	9.3	+ 1.9
Wire	5,190	5.7	4,626	5.1	−10.9
Sheet and strip	11,366	12.5	16,767	18.4	+47.5
Total	38,715	42.5	42,831	47.0	+10.6
Brass	17,162	18.8	14,867	16.4	−13.4
Rolled Zinc	4,733	5.2	5,528	6.1	+16.8
Die Casting	21,183	23.3	20,534	22.6	− 3.1
Zinc Oxide	3,317	3.6	2,215	2.4	−33.3
Zinc Dust	2,978	3.3	2,361	2.6	−20.8
Cathodic Protection	710	0.8	372	0.4	−47.7
Anodes for Electroplating	841	0.9	1.004	1.1	+19.4
Miscellaneous	1,444	1.6	1,236	1.4	−14.5
Total	52,368	57.5	48,117	53.0	− 8.2
GRAND TOTAL	91,083	100.0	90,948	100.0	− 0.2

The total consumption of zinc alloys during 1981 reached 21, 619 metric tons, of this total 11,166 tonnes were alloys with copper, and 10,254 tonnes were alloys without copper, which represent 51.6% and 48.4% of the total zinc alloys.

The total change compared with the previous year is −2.5%.

In 1981, rolled zinc increased by 795 tonnes when compared to 1980, this change represents a + 16.8%. The breakdown of the rolled zinc consumption is as follows: Rolled for building 2,657 tonnes, (48.1%); for dry cells 2,611 tonnes, (47.2%); and miscellaneous; 260 tonnes (4.7%).

Zinc dust consumption in 1981 rose to 18,992 metric tons, an increase of 3,407 tonnes (+ 21.8%) over 1980. The breakdown is as follows: chemical industry—2,606 tonnes (13.7%); purification—15,631 tonnes (82.3%); and zinc-rich paint—755 tonnes (4.0%).

The total consumption in 1981 of primary and secondary zinc oxide is estimated at about 10,500 metric tons.

Other uses, which include cathodic protection, anodes for electroplating and miscellaneous uses, decreased by 13.0%, that is, from 2,995 tonnes in 1980 to 2,608 tonnes in 1981.

ZINC IN THE UNITED KINGDOM 1981

Zinc Development Association
London, England

UK consumption of zinc in 1981 presented a more promising picture than in the previous year, reflecting a slow levelling-off of the current recession. Consumption of zinc in all forms rose 2,200 tonnes to 245,900 tonnes, whilst consumption of slab zinc increased five per cent to 190,200 tonnes, 8,900 tonnes more than in 1980.

Overall the pattern of consumption shows gains in several markets compensating for declines in others. Compared with 1980, strip galvanizing increased by 12,800 tonnes, but this comparison is misleading due to the steel strike in the first quarter of 1980 which severely affected this market. General galvanizing was 2,400 tonnes lower than in 1980, at 32,200 tonnes, however, total galvanizing increased 11,000 tonnes to 80,100 tonnes which is only ten per cent below the peak year of 1979.

Zinc used in brass declined 15 per cent to 56,400 tonnes, due to the general low level of industrial production in 1981, the principal markets for brass being in general engineering, construction and transport. Consumption of zinc for the production of zinc alloy used in die castings rose 2,400 tonnes to 40,100 tonnes. However, this figure includes alloy for export and so does not truly reflect the production of zinc die castings, which is expected to be slightly down compared with the previous year. The main use of zinc oxide is in rubber and the largest use of rubber is the tyre industry which has suffered from a reduced home market due to low priced imports from East European countries and increasing tyre life. Consequently there has been a steady decline in the consumption of zinc oxide which in 1981 fell 5,100 tonnes to 21,500 tonnes. Consumption of rolled zinc, which in the United Kingdom is used mainly in batteries, declined 3,300 tonnes, partly as a result of competition from alkaline zinc manganese dioxide cells which use zinc powder instead of a zinc can.

UK CONSUMPTION OF ZINC IN ALL FORMS 1977-1981
(In 000 Metric Tons)

End Uses	1977	1978	1979	1980	1981
Galvanizing					
General	34.1	35.7	34.4	34.6	32.2
Sheet and Strip	23.8	27.3	34.2	18.5	31.3
Wire	15.8	15.8	14.7	12.9	12.6
Tube	7.2	6.4	5.9	3.1	4.0
Galvanizing Total	80.9	85.2	89.2	69.1	80.1
Brass	87.5	86.7	81.6	66.7	56.4
Rolled Zinc	23.4	23.2	20.6	19.1	15.9
Zinc Oxide	32.4	29.8	29.9	26.6	21.5
Zinc Die Castings	62.7	65.9	62.1	37.7	40.1
Zinc Dust	12.6	13.5	12.9	10.5	10.7
Miscellaneous Uses	15.6	15.6	15.4	13.9	21.2
Total	315.1	319.9	311.7	243.6	245.9
of which slab zinc	244.8	247.6	238.8	181.3	190.2
Production of slab zinc	81.5	73.6	76.7	86.7	81.6

Slab zinc production was six per cent down at 81,600 tonnes. This was due to a failure at the main blower of the Imperial Smelting Furnace at Avonmouth which stopped production of slab zinc for one month, August to September. Zinc concentrates were in short supply due to strikes at Tara mines in Ireland and in Australia. Total imports of concentrates in 1981 declined 36 per cent to 52,100 tonnes. Peru was the major supplier at 20,800 tonnes, but imports from Australia fell to 5,400 tonnes from 17,500 tonnes in 1980 and imports from Ireland fell 39 per cent to 12,800 tonnes.

Review of Cadmium in the United States in 1981

The U.S. Bureau of Mines estimates 1981 consumption of cadmium metal at 4,896 tons, which is a 1,000 ton or 25% increase over the 3,896 tons estimated for 1980. U.S. refinery production of cadmium metal, both primary and secondary, remained essentially even in 1981 at 1,764 tons. Production of cadmium sulfide showed a 13 % increase from 883 tons in 1980 to 1001 tons in 1982. Other cadmium compounds, such as plating salts and oxide, went to 891 tons in 1981 from 911 tons in 1980.

Domestic cadmium production is expected to decline in 1982 with the closing of the Bunker Hill Company's Kellogg, Idaho zinc smelter at year-end 1981. Depressed metal prices, as well as environmental factors, contributed to the decision to close the smelter.

Cadmium stocks at metal producers increased through 1981 from 927 tons year-end 1980 to 1187 tons year-end 1981. Stocks at distributors fell, however.

Imports increased significantly from 2884 tons in 1980 to 3405 tons in 1981, a rise of 18% (Table 2). Major sources for imported cadmium metal were: Canada, 27%; Australia, 22%; Korea, 12%; Federal Republic of Germany, 7%; and Mexico, 6%. The U.S. exported 264 tons of cadmium metal in 1981 (Table 3).

The Federal Emergency Management Administration retained the cadmium stockpile goal of 5,850 tons of which 3,165 were on hand. No sales were made from the government stockpile.

The U.S. producer price of cadmium began 1981 at $2.50/lb. Prices softened during the year fluctuating between $1.75/lb. and $2.00/lb.

TABLE 1. SALIENT STATISTICS OF CADMIUM
(in tons of 2,000 lbs.)

	1980	1981
Stocks of Metal beginning of period:		
Metal Producers	570	927 +
Compound Producers	57	42 +
Distributors	360	487 +
Production (primary and secondary)		
Metal	1740	1764
Sulfide	883	1001
Other Components	911	891
Shipments		
Metal	1401	1685
Compounds	1818	2086
Apparent Consumption	3896	4896
Imports (Metal)	2884	3405
Exports (Metal)	260	264
Stocks of Metal end of period:		
Metal Producers	927	1187
Compound Producers	42	W
Distributors	489	233
Average U.S. Producer Price	$2.84/lb.	$1.93/lb.

TABLE 2. U.S. IMPORTS OF CADMIUM METAL
(in tons of 2,000 lbs.)

	1977	1978	1979	1980	1981
Algeria	—	22	—	—	—
Australia	448	448	352	632	764
Austria	—	6	—	—	—
Belgium-Luxembourg	246	322	262	46	66
Canada	471	735	766	909	929
China, People's Republic	—	—	—	18	88
Cocos Islands	—	—	—	9	—
Denmark	—	—	6	—	—
Finland	131	91	142	131	55
France	13	62	110	41	95
Germany, Fed. Rep.	44	101	23	11	255
India	6	9	—	55	7
Italy	—	7	—	—	39
Japan	—	5	11	10	20
Korea, Rep. of	105	266	220	193	404
Mexico	436	481	317	374	208
Netherlands	122	88	114	124	98
Norway	—	6	118	34	6
Peru	90	143	156	157	183
Portugal	—	—	8	—	—
South Africa, Rep. of	—	—	—	—	17
Spain	63	179	65	55	133
Sweden	22	53	25	5	—
United Kingdom	6	18	25	5	—
Yugoslavia	351	110	90	77	5
Zaire	17	39	28	—	33
Total	2,571	3,191	2,838	2,886	3,405

Source: U.S. Bureau of the Census

TABLE 3. EXPORTS OF CADMIUM METAL
(in tons of 2,000 lbs.)

1981	264
1980	260
1979	233
1978	360
1977	118

through September. In early October cadmium prices declined to $1.00/lb. and held until late December when they ended the year at $1.40/lb.

The U.S. Bureau of Mines does not collect actual consumption data for the uses of cadmium but estimates that 34% goes to plated hardware; 22% to batteries; 17% to transportation; 13% to pigments; 11% to plastic and synthetic products and 3% to other markets.

Electroplating continues to be the largest market for cadmium with applications in electronics and communications, automotive parts, industrial, military and aircraft fasteners, appliances and hardware. Cadmium plating is viewed as a must for many critical performance applications because of the unique combination of engineering properties it provides. Threaded fasteners and sliding parts, for example, are cadmium plated

because in addition to outstanding corrosion resistance, cadmium forms a tightly adhering, non-jamming, protective film which combines with its natural lubricity and full thread coverage to give smooth, free moving, parts assembly and operation over a long life. Low electrical contact resistance, formability, solderability, protective galvanic compatability with aluminum and steel, and resistance to hydrogen embrittlement on top of excellent overall corrosion protection lead to the specification of cadmium plating over the wide range of applications cited. Usage of cadmium in plating should continue to expand, especially with increased military spending and the overall national emphasis on long product life.

Batteries have and should continue to represent a major growth area for cadmium in both industrial and consumer applications. Rechargeable nickel-cadmium batteries have shown reliable service as well as low-maintenance and long-life.

The unique properties of cadmium pigments as long lasting high temperature resistant coloring agents have found them in a wide range of applications in synthetic polymers and plastics, artists colors, glasses, ceramics and vitreous enamels. Demand for cadmium pigments in these applications should remain strong.

Cadmium is also consumed as cadmium-bearing chemical stabilizers used to retard the degradation of plastics and hence protect against discoloration and mechanical breakdown. These benefits are provided by both the resistance to heat degradation during the high temperature processing of plastics and the resistance to discoloration and property degradation during exposure to ultra violet light over the intended usable life.

Other uses for cadmium are in soldering and brazing alloys, electrical contacts and catalysts. Future uses could develop for cadmium in solar photovoltaics and nuclear power generation.

CADMIUM IN CANADA 1981

M.J. Gauvin
Energy, Mines and Resources Canada
Ottawa, Ontario

Cadmium metal is recovered as a byproduct of zinc smelting and refining. The cadmium metal producers in Canada are: Canadian Electrolytic Zinc Limited, Valleyfield, Quebec; Kidd Creek Mines Ltd., (formerly Texasgulf Canada Ltd.), Hoyle, Ontario; Hudson Bay Mining and Smelting Co. Ltd., Flin Flon, Manitoba, and Cominco Ltd., Trail, British Columbia.

CANADIAN PRIMARY CADMIUM STATISTICS, 1977-80
(Metric Tons)

	1977	1978	1979	1980	1981[p]
Metal Production	1,369	1,265	1,455	1,303	1,293
Metal Capacity	1,705	1,705	1,705	1,705	1,705
Metal Shipments:					
Domestic	85	142	121	88	131
Exports					
United States	408	724	721	783	913
United Kingdom	404	379	561	312	531
Others	57	156	10	1	9

P-Preliminary

CADMIUM IN SPAIN 1981

V.R. Peña, Director
Asociacion Tecnica Española Para el Desarollo del Zinc
Madrid, Spain

The cadmium metal producers in Spain are: Asturiana de Zinc, S.A. and Española del Zinc, S.A.

Production, metal shipments—domestic and exports—during the years 1979-1981, are shown in the following table:

SALIENT STATISTICS
(Metric Tons)

	1979	1980	1981	Change% 1981 over 1980
Production	222	309	301	- 2.6
Metal shipments:				
Domestic	120	97	68	-29.9
Exports	72	246	244	- 0.8

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The services and publications of the Zinc Institute are available without charge to anyone interested in the utilization of zinc, zinc containing, or zinc-coated products.

Its programs are funded primarily through the voluntary acceptance by producers of assessments against their sales in the United States and Canada.

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All data presented herein are in short tons unless otherwise specified. Short tons are converted to metric tons by multiplying by 0.907185. To convert metric to short tons multiply by 1.10231.

Zinc Institute Inc.

292 Madison Ave., New York, N.Y. 10017
(212) 578-4750

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